

CLAIMS

1. A medical device to constrict or occlude a body tissue or vessel, comprising:

5 a first tissue-engaging member 205 having opposed walls 230, 232 and a first connecting wall 234 defining a first elongate channel 236;
 a second tissue-engaging member 210 opposed to the first tissue-engaging member 205 having opposed walls 240, 242 and a second connecting wall 244 defining a second elongate channel 246; and
10 a securing member 220 for securing the first and the second tissue-engaging members 205, 210 such that front faces of the first and the second connecting walls 234, 244 are opposed to each other.

2. The medical device of claim 1, wherein each of the front faces of the first and the second connecting walls 234, 244 includes a plurality of tissue-penetrating elements 238, 248.

3. The medical device of claim 1, wherein the securing member 220 is sized and configured to slide into the first and the second elongate channels 236, 246 to securely clamp the first and the second tissue-engaging members 205, 210 around the body tissue or vessel with minimal compressive force.

5 4. The medical device of claim 3, wherein the force required to secure and maintain adequate traction is independent from the force required to constrict or occlude the body tissue or vessel.

5. The medical device of claim 4, wherein only a compressive force needed to perform a specific surgical procedure such as occlusion, ligation or fixation is applied to the body tissue.

6. The medical device of claim 5, wherein tissue necrosis due to over-compression is eliminated.

7. The medical device of claim 1, wherein at least one of the first and the second tissue engaging-members 205, 210 includes a plurality of bumps, ridges, slots, and holes.

8. The medical device of claim 1, wherein the securing member 220 is a spring clip or a deformable clip acting as a retention member and providing uniform pressure across the occluded tissue or vessel.

9. The medical device of claim 2, wherein the first and the second connecting walls 234, 244 and the tissue-penetrating elements 238, 248 are formed as an integral, one-piece construction.

10. The medical device of claim 2, wherein the tissue-penetrating
5 elements 238, 248 are formed in a plurality of rows.

11. The medical device of claim 10, wherein the number of tissue-
penetrating elements 238, 248 per row and the number of rows vary according to
each application.

12. The medical device of claim 10, wherein the tissue-penetrating
elements 238, 248 are aligned or staggered.

13. The medical device of claim 2, wherein the tissue-penetrating
elements 238, 248 and the securing member 220 have cross-sections of any
configuration including polygonal, circular and elliptical configurations.

14. A medical device 500 to constrict or occlude a body tissue or vessel,
comprising:
a first tissue-engaging portion 505 having a first face including a plurality
of tissue penetrating elements or protrusions 525;
5 a second tissue-engaging portion 510 opposing the first tissue-engaging
portion 505 having a second face including a plurality of tissue penetrating
elements or protrusions 530; and
a deformable portion 520 connecting the first and the second tissue-
engaging portions 505, 510.

10 15. The medical device of claim 14, wherein only a force required to²⁴
perform a specific surgical procedure such as occlusion, ligation or fixation is
applied to the body tissue or vessel.

16. The medical device of claim 15, wherein tissue necrosis due to over-
compression is eliminated.

17. The medical device of claim 14, wherein the medical device is formed
from a flat metal sheet that is die-cut, stamped or etched forming a first notched
or toothed portion of the first tissue-engaging portion 505, a smooth connecting
portion of the deformable portion 520 and a second notched or toothed portion of
5 the second tissue-engaging portion 510.

18. The medical device of claim 17, wherein a plurality of notches or teeth
of the first and the second portions are bent so as to extend in the same direction
or plane and to form channels within the notches or teeth.

19. The medical device of claim 17, wherein the device is formed in a U-
shape by bending the deformable portion 520 so that the notches or teeth of the
first and the second tissue-engaging portions 505, 510 are opposed.

5 20. The medical device of claim 14, wherein the device is formed from
any medically acceptable metal or plastic material that is ductile, malleable or
deformable.

21. The medical device of claim 20, wherein the metal includes titanium
and stainless steel.

22. An applier 600 for applying a medical device to constrict or occlude a
body tissue or vessel, the device having a first tissue-engaging member 205
having opposed walls 230, 232 and a first connecting wall 234 defining a first
elongate channel 236, a second tissue-engaging member 210 opposed to the
5 first tissue-engaging member having opposed walls 240, 242 and a second
connecting wall 244 defining a second elongate channel 246, and a securing
member 220 for securing the first and the second tissue-engaging members 205,
210 such that front faces of the first and the second connecting walls 234, 244
are opposed to each other, the applier comprising:

10 an elongate shaft 605 having a proximal end and a distal end 610;
a pair of opposed jaws 615, 620 connected at the distal end of the
elongate shaft 605;
a handle operably connected at the proximal end of the elongate shaft 605
to open and close the opposed jaws 615, 620; and

15 a sliding member 625 operably connected within the elongate shaft 605 to advance the securing member 220 over the first and the second tissue-engaging members 205, 210 after closure of the jaws 615, 620.

23. The applier of claim 22, wherein the jaws 615, 620 operate to apply the first and the second tissue-engaging members 205, 210 around a target body tissue or vessel.

24. The applier of claim 23, wherein the first and the second tissue-engaging members 205, 210 are applied to the jaws 615, 620 either manually or automatically.

25. The applier of claim 23, wherein the jaws 615, 620 are compressed using only a force required for a specific surgical procedure such as occlusion, ligation or fixation.

26. The applier of claim 25, wherein the first and the second tissue-engaging members 205, 210 and the securing member 220 are introduced to a surgical site in an un-assembled condition through a small port or trocar.

27. The applier of claim 26, wherein the sliding member 625 operates to urge the securing member 220 forward and over the first and second tissue-engaging members 205, 210 to secure the medical device.

28. The applier of claim 27, wherein the applier and the medical device are sized and configured for use in a minimally invasive or laparoscopic surgical procedure.

29. The applier of claim 22, further comprising a plurality of slots in each of the opposed jaws 615, 620 to receive a plurality of the medical devices or multiple staple-clips to simultaneously apply the medical devices or staple-clips.

30. The applier of claim 29, further comprising a cutting member to be advanced between the medical devices or staple-clips after they have been applied to transect the body tissue or vessel between the medical devices or staple-clips.

31. A clip applier 850 for applying a clip to constrict or occlude a body tissue or vessel, the clip having a first arm 880 including a latch mechanism 890 at a distal end and a second arm 885 folded over the firm arm 880 at a distal end and configured to interlock or mate with the latch mechanism 890 of the first arm

5 880, the applier comprising:

 a handle 885 for storing the clip; and
 a thumb actuated mechanism 860 operably slidable along the handle 885 by sliding the thumb actuated mechanism 860 forward 870a and backward 870b to release the clip.

10 32. The clip applier of claim 31, wherein the handle 855 further comprises a reservoir for storing a plurality of clips 865.

33. The clip applier of claim 32, wherein the plurality of clips 865 are strung end-to-end in a clip sleeve 892 suspended through an end port.

34. The clip applier of claim 33, wherein the plurality of clips 865 are formed from a single piece of material.

35. A clip 875 to constrict or occlude a body tissue or vessel, comprising:
a first arm 880 including a latch mechanism 890 at a distal end; and
a second arm 885 folded over the firm arm 880 at a distal end and
configured to interlock or mate with the latch mechanism 890 of the first arm 880.

36. The clip of claim 35, wherein the latch mechanism 890 is a hook.

37. The clip of claim 36, wherein at least one of the first and the second arms 880, 885 includes tissue-penetrating elements 898 or securing elements 1023, 1024 on an inner face.

38. The clip of claim 35, further comprising a third arm 899 connecting the first arm 880 and the second arm 885.

39. A clamp 950 to constrict or occlude a body tissue or vessel, comprising:

a tubular section 955 having an opening 960 extending from a proximal end 965 to a distal end 970; and

5 a lead-in wire 975 operably attached to the proximal end 965 and is movable between an open position and a closed position,

wherein in the closed position, the lead-in wire 975 is slidably received and secured in the opening 960 of the tubular section 955.

40. The clip of claim 39, wherein the lead-in wire 975 is bent against a wall of the tubular section 955 to further secure the body tissue or vessel.

41. The clip of claim 39, wherein the clamp is used in donor nephrectomy.

42. A medical device 1010 to constrict or occlude a body tissue or vessel, comprising:

a clip 1011 formed from a first wire including opposed arms 1013, 1014 and openings 1015, 1916; and

5 a staple 1012 for securing the clip 1011, the staple 1012 formed from a second wire having legs 1017, 1018 to puncture the body tissue or vessel and to interlock the clip 1011 through the openings 1015, 1016.

43. The medical device of claim 42, wherein the arms 1013, 1014 further comprise a latch mechanism at their distal ends to mate with each other when the arms 1013, 1014 are closed or clamped together.